Cryptocurrency crash course: The no-arbitrage ceiling and other thoughts

JOHANNESBURG — After flirting with a dizzying $20,000 price point in December last year, Bitcoin is truly now a bubble in the process of bursting as it sunk below the $9,000 mark over the weekend. Anybody foolish enough to buy it at the high point in December will now find themselves probably trying to cut their losses. As blood on the crypto markets continues to get messier, one can expect interest in crypto trading to wane. However, the underlying blockchain technology still has lots of great, potential use-cases in future – that is, if the banks and regulators allow it to be adopted globally. Here is a piece by InvestSouthAfrica.co.za that provides a nice summary on the latest and most important events to have happened in the cryptocurrency space. – Gareth van Zyl

From InvestSouthAfrica.co.za

The last few years have been a great time to "hodl" – the term used by the crypto-community for buying cryptocurrency and "holding on for deal life". Those who were hodl'ing Ethereum in September 2017, had the added bonus of receiving what the community call an "airdrop", when Omise gave Ethereum holders 5% of their cryptocurrency for free! (yes, there are reasons behind the madness of giving away assets for free – it helps broaden the base of users from the start)

The feverish speculation on cryptocurrencies have made a few astonishingly rich. If you think the likes of Mark Zuckerberg made their fortune quickly; consider Chris Larsen, the executive chairman of Ripple, who moved to a net worth of $59bn earlier this year, briefly pushing him ahead of Zuckerberg as the world's 5th richest person – the value of Ripple subsequently reduced dropping his paper wealth by $44bn in the space of 2 weeks! (I can just imagine what was going through his head at the time 'BOUNCE MOTHERF***** BOUNCE').

is it a coincidence that the massive downswing followed shortly after Bitcoin futures were opened for trading on the CBOE and CME? More on this later.

As for your average investor, well it's difficult when you're eking out a 10% return, whilst your less intelligent neighbour is making 1000% on his Bitcoin investment, and announcing his early retirement.

Cryptocurrencies evoke strong opinions about the extent to which they'll disrupt global payment systems, and whether to invest in them. In fact, judging from my conversations with people, there's a good chance you've already made your mind up and staked out a position on crytocurrencies and are merely reading this to obtain confirmation bias! And whilst there are some who are converts there are others who dismiss cryptocurrencies as the flavour of the month which will eventually peter out. This is possible, as nations' regulatory systems are playing catch-up and need to decide how to regulate cryptocurrencies, and to the extent that they ban cryptocurrencies it becomes game over for cryptocurrencies. However dismissing cryptocurrencies outright fails to recognise the potential for it being a disruptive force on the global payments systems, to the extent that they're allowed to by regulators.

Most of those who are strong believers have already bought some; but if you strongly believe it's a bubble, why haven't you shorted? I, personally, am sitting on the sidelines (I'm a 'nocoiner' in crypto parlance) – I don't feel like I've got enough of an edge. There's simply too much regulatory risk and I don't know which cryptocurrency will be the winner when the dust setttles and we're 5 years into the future. For those who are panicking that they're missing an opportunity of a lifetime, don't stress too much, one thing you can be certain of in the investments world is that opportunities will keep flying by, as surely as night follows day. Only commit to the obvious opportunities.

Cryptocurrency Mining

Unlike conventional currencies, the money supply of cryptocurrencies is not controlled by a Central Bank. Mining/currency creation revolves around solving mathematical problems rather than politics; and Bitcoin for instance has a maximum number of 21 million coins. Bitcoin is now 80% of the way to its 21 million mark, but as the mathematical problems get harder over time, it's expected that the 21 million mark will take a while to be reached.

Commoditisation of Mining

Cryptocurrency mining has become such a big industry, that the world's largest chipmaker, TSMC, is reporting on it impacting on financial results. The market supplying cryptocurrency mining rigs is dominated by Canaan Creative and Bitmain (both of whom work with TSMC in getting their silicon), but now even Samsung has begun manufacturing mining-specific chips.

With off the shelf chips being supplied, Bitcoin mining doesn't require any genius level of brainpower or knowledge, the main requirements are cheap power and a Crypto-regulatory friendly country (more on that later). In investment lingo, we could say that **Bitcoin mining is becoming commoditised**.

Arbitrage Pricing

Over the long run, economic theory says that commoditised producers should achieve profits only equal to their cost of capital. If the price of Bitcoins is so high that miners can achieve profits in excess of their cost of capital, then new players could get involved and earn excess profits until the price of Bitcoins falls so that excess profits aren't available (or the cost of mining increases). On the other hand, if the price of Bitcoins is so low that miners aren't achieving their cost of capital in profits, then theoretically miners should be leaving the industry until the price of Bitcoin rises sufficiently (or the cost of the mining equipment and electricity reduces) – which could never happen, as miners' contribution to supply is rapidly diminishing. Of course most/some of the equipment for mining is probably a sunk cost; so the mining could go on for some time until the equipment wears out and/or even the marginal cost (mostly electricity) doesn't achieve sufficient profit.

How Futures Help

There's a time delay between purchasing your Bitcoin mining gear and the time when the stream of Bitcoins start rolling in, and the risk is that the price of Bitcoins drops after you bought your mining gear, resulting in a loss. To

whereas the contract size on the CME is 5 Bitcoins). This will allow you to sell your Bitcoin when it's eventually mined at a set price.

It's likely not a coincidence, in my view, that the crash in cryptocurrency prices occurred shortly after futures were introduced, making the arbitrage more efficient.

Having said that, it's still far from watertight – complications that arise include having to factor in the order of difficulty of mining changing, and it's becoming exponentially more difficult as more sophisticated equipment is developed. This is not to mention the timing risks – e.g. if you mine your Bitcoin in a year's time instead of 6 months. The difficulty in getting the latest most efficient mining gear plays a huge role for your man in the street wanting to get in on the action.

Because the cost of mining changes (as well as other factors), it's important to note that this soft ceiling also changes – likely increasing over time as the difficulty levels of solving the problems become harder, the reward less, rising faster than efficiencies (well, that's my guess – again, I don't consider myself an expert at it, so that's based on my knowledge and intuition).

Cost of Mining Gear

I have no experience in this, but this article puts a figure forward at $5200 for mining gear ($3700) and electricity ($1500), to mine a coin a year. Naturally, an investment return needs to be added to that to figure out the cost of capital, and this will be high, given the risky nature of the endeavour. At the time of writing, the price of a bitcoin was around $9,000.

I chatted to our resident IT expert, and he referred me to this Youtube clip on "Is Mining on ASICs Worth It?" (Nerd note: ASIC stands for Application Specific Integrated Circuit…ie it's made to do only one thing, in this case mine cryptocurrencies – long gone are the days when you could mine Bitcoin as a hobby from your home computer!). It looks at BITMAIN ANTMINER ASICs. BITMAIN describes itself as the "World's Most Efficient Miner". The Antminer S9 computer is the top of the range, and has been designed to do only one thing – mine SHA256 cryptocurrencies (SHA256 is a cryptographic hash function…not important to understand for the purposes of this article). Unfortunately BITMAIN isn't even accepting pre-orders for the S9. So, there's another hurdle to become a miner – you've got to be well connected to get hold of the best equipment timeously. [1]

Demand & Supply Rules

Of course the price of Bitcoins, just like the price of anything, is determined via supply & demand. And it's not just Bitcoin miners who are supplying Bitcoins; many "investors/traders" are doing the same – I unfortunately don't have statistics for the relative activity of miners and investors/traders, but I imagine it's the traders that dominate; as it's becoming harder and harder to generate Bitcoins.

So, the price of Bitcoins can spend time above the no arbitrage ceiling; although I would have thought that it would spend most of its time below it (not above, as it might be at the moment…or is it once risk is priced in?). As time goes by and mining becomes ever more commoditised, I suspect the ceiling will become higher, probably making it superfluous at some point (as it's so much higher than the price of Bitcoins) – but we're not there yet, and the ceiling is very much in play at the moment and influencing prices. If I was looking for an entry point into cryptocurrencies (which I'm not), I'd be looking at a target price where it doesn't pay to mine anymore (roughly $1500 for Bitcoin on a marginal cost basis based on my current knowledge – if I was thinking of investing I'd do (a lot) more research on the marginal costs of mining – NB this number is also a moving target – by the time you're reading this it's already out of date!).

Another factor which will have a massive impact on demand/supply is regulatory interference, once regulators eventually wake up! More on this later.

TRENDING

Steinhoff: These 6 char have alerted the board Black

Beware the Scammers

Unfortunately, there are many scams which involve cryptocurrencies, too many to detail in this writeup. To get an idea, though, Facebook recently banned all cryptocurrency-related ads as they are "frequently associated with misleading or deceptive promotional practices" (they also banned binary options, but that's a story for another day).

There's a new spin on the old multi-level marketing game; where the asset being sold is a company which is mining bitcoins. To quote from a Bitcoinzar article: "There are thousands of bitcoin cloud mining websites, but only a very very small amount are real. The ones that are real, are not very profitable, and you don't make a lot of money. If a website is offering you bitcoin mining and promising great returns, you are almost certainly going to be scammed, or you might just be joining a pyramid / ponzi scheme that says it is bitcoin mining but it is not. Many bitcoin mining websites are just websites, nothing more, they do not mine, they just take your bitcoin, and pay you back small amounts over a long period of time, often vanishing before you have made back your money."

But forget for a moment that operating a profitable bitcoin mining company is very difficult; the other reason to avoid getting involved is because of the small percentage of people who make money in a **multi-level marketing** setup. The greater the percent of the money which gets distributed for recruitment, the worse it is. Additionally, the suckers who get dragged into it, then exploit their personal relationships to drag their friends and loved ones into the quagmire.

A more subtle scam is one where software is surreptitiously installed on your computer, which is then used to mine cryptocurrency for the benefit of somebody else.

In the US complaints have been filed about **My Big Coin** cryptocurrency, which was allegedly part of a ponzi scheme where claims were made that it was backed by gold, tradable on various exchanged & had a partnership with MasterCard). Meanwhile **SpriteCoin** goes one further – not only is it a fake cryptocurrency, but it also installs ransomware on your computer!

Buffet & Munger

Recently Warren Buffett and Charlie Munger were quoted on cryptocurrencies:

- Buffett: "In terms of cryptocurrencies generally, I can say almost with certainty that they will come to a bad ending…We will never have a position in them…If you're buying something because it went up yesterday or last week, that is not a good reason for buying anything."
- Munger: "Bitcoin and the other cryptocurrencies are bubbles."

Of course this had cryptocurrency protagonists up in arms:

As an ardent follower of Buffett and Munger, I would have felt they'd lost their minds if they had invested. So, I conclude the same as the great men and you can stop reading now if you want!

"I don't look to jump over 7-foot bars; I look around for 1-foot bars that I can step over." –Warren Buffett

Warren Buffett and Charlie Mugner

Cryptocurrencies have some uses

You can **transact** with people in the same currency wherever in the world you or they are, without the assistance of a bank, as long as your counterparty is also willing to trade in the relevant cryptocurrency. You don't have to change your Rands into US Dollars; you can merely spend Bitcoins whether you are in South Africa or the US. And the transactions are typically far faster than cross-border transactions between banks, which can take several days; but Bitcoin transactions take some 10 minutes, so it's not quick enough buy goods and pay in person.

Your transactions can be anonymous, with the level of anonymity varying across cryptocurrencies.

The money supply of cryptocurrencies is not controlled by a **Central Bank** – they typically have a fixed amount which can be mined. This protects them from government policy resulting in money being printed which depreciates the currency.

Elimination of third parties.

Low transaction **fees**.

Bitcoins can be stored offline ("cold storage") on a hard drive or flash drive, which makes their **security** similar to that of cash, or they can be stored online in the cloud (hot storage). Hot storage is generally considered to make it easier to steal Bitcoins than cold storage. However, using cold storage means that you have to move your tokens online before you can transact.

Initial Coin Offerings (ICOs)

ICOs are used to raise funds for new cryptocurrencies.

Will countries outlaw them?

At the moment most countries are watching the cryptocurrency saga unfold. There are concerns over their potential use in illegal activity, money laundering, tax evasion and undermining the need for their currencies. So, will cryptocurrencies destroy the need for conventional currencies, or will governments destroy cryptocurrencies? As is usually the case, it's the extremes which are less likely.

Monero, Zcash or Dash. Bitcoin is anonymous until somebody links your real ID with your Bitcoin address; so if you say pay your rent in Bitcoin, your landlord will be able to see all transactions with that Bitcoin address!

If countries decide to outlaw cryptocurrencies then that is pretty much game over, except for those who are willing to transact illegally. For now, it's a minority of countries which have explicitly declared the use of Bitcoins illegal – these include **Bangladesh and Nepal**.

Other countries have partial bans or discourage its use; Bank **Indonesia**, for instance has banned financial services companies from conducting transactions in cryptocurrencies. Other countries are considering making mining cryptocurrencies illegal, but transacting and trading them to be legal.

The **US** Securities & Exchange Commission has prevented the issue of cryptocurrency exchange traded funds. Steven Mnuchin, the US treasury secretary, has said that he's number one focus is that "they're not used for illicit activities". In December 2017 Bitcoins debuted on an established exchange, the CBOE Futures Exchange, and a week later CME Futures Contracts were launched.

China has outlawed Initial Coin Offerings and Chinese exchanges, and according to a Bloomberg report it is prepping to block access within China to all cryptocurrency trading platforms. Officials are also calling on local authorities to shut off power supplies to miners.

From 30 January 2018 **South Korea** are banning using anonymous bank accounts when trading in cryptocurrencies; to help prevent money laundering. Traders may only make deposits into cryptocurrency exchange wallets if the account name on the cryptocurrency exchange matches the name on the bank account from which the deposit is moving.

On the other hand **Japan** signed into law a "Virtual-Currency Act", which allows cryptocurrencies to be used for making payments. Eleven exchange allowances have been given by Japan's financial services authorities. Japan is showing early signs of taking the crypto lead.

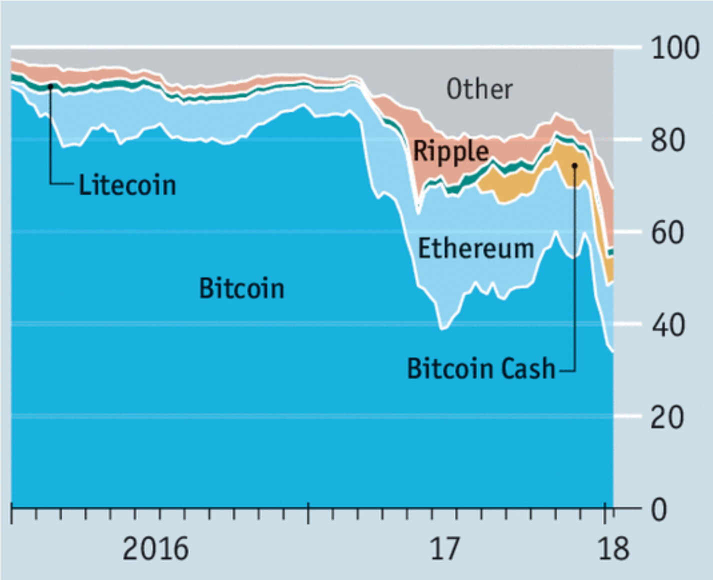
The Flippening

Despite all the focus on Bitcoin, for some time now it's no longer the only game in town. Different cryptocurrencies reflect differences in:

- cryptography used to secure transactions
- methods used to validate transations
- methods used to mine more of the currency

There are over 1000 cryptocurrencies (1438 at the time of writing, to be precise – according to Coinmarketcap.com), with a new one born almost every day. Many have never been used to carry out a transaction to purchase a good or service – they've only been used for speculative trading.

The current market leaders are Bitcoin, Ethereum, Ripple and Bitcoin Cash (Bitcoin Cash was created to solve the long transaction times on Bitcoin). Whilst Bitcoin remains the leader; cryptocurrency followers keenly watch the landscape to see when "the flippening" will occur – ie the point at which another cryptocurrency overtakes Bitcoin in terms of market capitalisation. Some tip Ethereum to be the top dog by the end of 2018.



Source: CoinMarketCap

As investors, naturally we want to back the horse which is ultimately going to win this race. However, it's not obvious at this stage who the winners will be, or even how many winners there'll be. But as Mark Twain said: "History doesn't repeat itself but it often rhymes". We're at a stage of development similar to that of motor vehicles in 1900 where it was not obvious who the future dominant motor vehicle manufacturers would be, e.g. there were hundreds of manufacturers in addition to Ford and General Motors (even for Henry Ford he was only successful on his 3rd corporate try). A more recent experience is the salad days of the internet in 1998 with many high flying dot.coms and we did not know who the winners would be (e.g. in 1998 I was using HotBot to do my internet searches and Google only came into existence on the 4th September 1998).

It's possible that the winning cryptocurrency hasn't even been launched yet; for example it's rumoured that Facebook may introduce a cryptocurrency. The various cryptocurrencies are set up in slightly different ways, and one should examine how much more effectively each of them solves customer problems.

However, I doubt there'll be many winners; as the advantage of a cryptocurrency is magnified when it's universal.

If we can't predict the winners, can we at least identify possible losers? As mentioned above, my view is that we'll eventually see the hyperanonymous and untraceable cryptocurrencies like Monero, Dash and Zcash being outlawed.

Aside: In the meantime, in the survival of the fittest contest, the CashBet cryptocurrency has become the first one to seal a deal with a major sports club; Arsenal signing a sponsorship deal with them.

Liquidity

Whilst the currency / forex markets are the deepest and most liquid in the world (an average of $5.1 trillion traded per day in April 2016), cryptocurrencies' liquidities vary wildly between each other and over time. My guess is that part of the reason for the massive price movements in cryptocurrencies is changes in liquidity.

No reliable way of predicting value

Cryptocurrencies, like other currencies, are merely tokens which can be exchanged for goods & services; they cannot themselves be consumed and have no intrinsic value, their value is based on supply and demand. Tokens only have value as long as they remain a preferred medium of exchange for at least some types of transactions. For a currency to exist there must be a large enough group of people who agree to use it.

Of course with conventional currencies; their use as a medium of exchange naturally follows from the fact that governments legally require their currencies to be accepted in exchange for goods and services; whereas nobody requires you to quote a value in Bitcoins for customers.

A lot of the demand for cryptocurrencies appears to be for "investment" purposes. Just as quickly as demand arrived, it could disappear, e.g. :

- when perceptions of the winners and losers changes
- when interest in cryptocurrencies as a whole fades.
- fraud dampens demand/increases supply, e.g. BlackWallet was recently hacked, and North Koreans are suspect to be actively involved in trying to steal cryptocurrencies.

For supply we can differentiate between:

- the number of sell orders of people who own the cryptocurrency.
- the maximum number of units of a cryptocurrency versus current circulated supply (this shows the maximum which may still be mined).

The unpredictability of supply and demand is why investing in cryptocurrencies is highly speculative.

Quantity Theory of Money

The total amount of a currency in circulation, the money is used by a certain number of people who agree to use it (e.g. the Rand being used mostly by South Africans), and is passed around amongst them in the form of transactions. The speed/velocity with which the money is passed around may be defined as:

V = QP/M

Where: Q is the number of transactions in that currency in a year, P is the average price level and M is the amount of the currency in circulation (the money supply).

So, for example, if the South African economy produced R100 worth of goods and services in a year, and there's R10 of currency in circulation, then the velocity is 10, the currency would need to be turned over 10 times in a year.

This equation can be rearranged:

MV = QP

Now, if velocity and the number of transactions are constant (which we know they're not…but maybe broadly so!), then changes in the money supply are directly proportional to changes in the average price level. And that is the Quantity Theory of Money. It's at the heart of some of the biggest disagreements in economics.

Note as well, that if people believe the value of money will increase in the future, they may hold onto it, ie velocity reduces (see how easy it is to rip holes into the Quantity Theory of Money).

Anyway, here are a couple of calculations of the implicit value of a Bitcoin done using the Quantity Theory of Money:

- $1919; 19 Jan 2017; on Quora
- $20; 1 Feb 2018; letter to the FT

The key take from this is that you can arrive at radically different values depending on your assumptions!

An Environmentally Irresponsible Investment?

Anybody concerned about global warming wont like the **electricity consumption** required to drive the mining operations of cryptocurrencies; although this is ameliorated by the fact that the cheap electricity being sought is sometimes geothermal (Iceland) and hydro-electric (e.g. Tibet and Quebec). The Moonlite Project is developing a crypto-mining center in Iceland which will utilise 15 megawatts of clean energyand produce some $8m per month of mined cryptourrencies.

Some project that cryptocurrency miners could use electricity equal to all the world's current utilisation by 2020. But that assumes that cryptocurrency mining wont become more efficient, with simpler mining algorithms, and more efficient computer hardware setups. Perhaps more likely, is that crytocurrencies with expensive mining will become less popular; or change the way they do things.

Ultimately, in my opinion, the innovation likely to cause more stress on the electricity network is probably electric motor vehicles.

Blockchain Technology

The usefulness of blockchain technology is often cited, however this isn't a reason to invest in cryptocurrencies. The technology is open source (as far as I'm aware) and has been replicated by many cryptocurrencies, and can easily be replicated in other instances.

Digital money, like the Rand, is in the tangible form of Rand notes and coins, but is also in the intangible form stored digitally in centralised ledgers at commercial banks and at the Reserve Bank, and privately (the man in the street cannot go have a look at the ledger). The emphasis here is on the word "**centralised**". Blockchain technology enables the digital ledgers for money to be stored in a **decentralised** and publicly visible manner.

Whenever a unit of a cryptocurrency is moved from one account to another (a transaction), miners are paid to update the ledger, everybody can see it being updated. In fact, it's a group of transactions that are formed into a "block", and each block is "chained" to the previous one allowing it to be verified.

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